

REMARKS

Applicants have disclosed a process for producing hexafluoropropylene oxide that provides a product that contains fewer impurities and is more stable than the hexafluoropropylene oxide produced by other processes. When hexafluoropropylene is reacted with oxygen to form hexafluoropropylene oxide the resulting reaction mixture contains a variety of impurities including: unreacted hexafluoropropylene, water, hydrogen fluoride, hexafluoroacetone, perfluoropropionyl fluoride, perfluoroacetyl fluoride, and carbonyl fluoride (page 1, lines 14-20). The impurities present in the hexafluoropropylene oxide are a substantial detriment to the use and stability of the product. For example hexafluoroacetone, water and hydrogen fluoride are known to hinder the polymerization reaction of hexafluoropropylene oxide thus make its use to produce fluorinated resins difficult (page 1, lines 23-27 and 10-14).

As stated in the present specification, the removal of water from the reaction product of hexafluoropropylene oxide and oxygen provides a hexafluoropropylene oxide with improved polymerization properties (page 2, lines 5-16). The removal of water may be accomplished with a water-absorbing material. However, the use of a water-absorbing material such as a molecular sieve causes other problems. For example, contacting hexafluoropropylene oxide with a molecular sieve, e.g., in the presence of water, can lead to isomerization of the hexafluoropropylene oxide to form hexafluoroacetone. Thus, even if a water-absorbing material such as a molecular sieve successfully removes water, e.g., aqueous impurities, the resulting hexafluoropropylene oxide may in fact be less pure because of the aforementioned isomerization reaction (page 2, lines 17-24).

Applicants have disclosed that the use of certain water-absorbing materials can effectively remove water without catalyzing any undesired side reaction. In particular,

certain oxides may be used as water-absorbing materials. Other oxides must be avoided, see for example the discussion at page 7, lines 3-16, reproduced below for convenience:

Further, if an oxide of a transition metal such as Fe, Cr or Ni, an oxide having high acidity such as silica/alumina, alumina/titania, alumina/zirconia or alumina, is employed, isomerization of HFPO will take place. Especially, if such a metal oxide is fluorinated by HF and converted to a fluorinated metal oxide, the acidity will be high and, as disclosed in JP-A-58-62131, will act as a highly active isomerization catalyst. Whereas, the oxides of at least one metal selected from Groups 1 and 2 of the Periodic Table, Zr and Si, of the present invention, have no isomerization ability by themselves, and even if they are fluorinated by HF, the acidity will not be high, whereby isomerization of HFPO is believed to be suppressed.

Thus, it is critical to use a water-absorbing agent that effectively removes water and other impurities without catalyzing other reactions of hexafluoropropylene oxide that may form different impurities. The particular group of water-absorbing agents that may be used for this purpose is recited in Claim 1.

The specification describes several inventive examples and a comparative example. The comparative example uses molecular sieves as a drying agent and is thus a side-by-side comparison of the closest prior art (i.e., Lowell discussed further below). The inventive examples demonstrate the use of adsorbents according to the claimed invention. The resulting hexafluoropropylene oxide materials are described in Table 3 on page 21 of the specification (reproduced below for convenience):

		Concentrations of impurities in HFPO (vol ppm)			
		Water	HF	HFA	PFPF
Before purification		210	1,500	2,200	1,450
After purification	Ex. 1	30	15	20	0
	Ex. 2	20	1	20	0
	Ex. 3	15	20	10	0
	Ex. 4	5	10	0	0
	Ex. 5	5	5	0	0
	Ex. 6	8	15	0	0
	Comp. Ex. 1	50	1,530	6,800	7,200

As is readily evident from the table above, the use of a molecular sieve adsorbent provides a hexafluoropropylene oxide that contains substantially more impurities than the hexafluoropropylene oxide obtained according to the claimed invention.

The Office rejected the original claims as obvious in view of a patent to Lowell (U.S. 3,412,148). The Office cited to column 2, lines 23-34 of Lowell as evidence that it would be obvious to use the drying agent of the present claims in the prior art process. The prior art disclosure at column 2, lines 23-34 is reproduced below for convenience (underlining added for emphasis):

Referring now to FIGURE I, gaseous hexafluoropropylene oxide from storage tank 1 passes through control valve 2 and is combined with any recycle hexafluoropropylene oxide entering through control valve 3. The combined flow passes through drying tower 4 containing a drying agent such as a molecular sieve. The dry hexafluoropropylene oxide is condensed in condenser 5 and then enters the first reactor 6. Since the polymerization reaction produces heat which must be removed, it is preferable that condenser 5 cool the hexafluoropropylene oxide to a temperature slightly below the desired reaction temperature.

Lowell discloses the use of a molecular sieve as a water-absorbing agent. Lowell does not disclose or suggest the use of other water-absorbing agents nor does Lowell recognize the drawbacks of using a molecular sieve. As already discussed above, contacting hexafluoropropylene oxide with a molecular sieve, e.g., in the presence of water, results in the isomerization of hexafluoropropylene oxide to form hexafluoroacetone. Hexafluoropropylene oxide produced by drying with molecular sieves contains an increased amount of hexafluoroacetone which is known to detrimentally affect the ability of hexafluoropropylene oxide to polymerize.

In making the rejection, the Office treated all drying agents (e.g., water-absorbing agent) as generic and gave no weight to Applicants disclosure that the drying agents recited

in the present claims have significant advantages in comparison to generic drying agents such as the molecular sieves disclosed in Lowell.

Applicants submit that there is nothing in Lowell to suggest that the use of the particular water-absorbing agents recited in present Claim 1 can provide an advantage over Lowell's molecular sieves. The Office asserted that the use of absorbents such as charcoal to remove water from propylene oxide is well-known in the art. Applicants submit that propylene oxide and hexafluoropropylene oxide are substantially different materials and that a process for producing propylene oxide does not render obvious a process for producing hexafluoropropylene oxide. This is demonstrated, for example, by Applicants' disclosure that the use of particular water-absorbing agents such as molecular sieves in the production of hexafluoropropylene oxide forms a hexafluoropropylene oxide product that contains increased amounts of impurities such as hexafluoroacetone.

During a discussion with the Examiner on August 25, 2006, it was explained that the use of the particular drying agents of the present claims is critical to obtaining a high purity hexafluoropropylene oxide that is low in the impurities that hinder the polymerization of the desired product. The Examiner appeared to agree with the comments of Applicants' U.S. representative and indicated that the rejections may be withdrawn upon review of Applicants' written response.

The Office rejected Claim 1 as incomplete for omitting essential steps. The Office is of the opinion that the process of the present claims is one that should be described as "purifying hexafluoropropylene oxide." Applicants traverse the Office's rejection. There is nothing in the present specification that states that the process is only one of purifying hexafluoropropylene oxide. Applicants are aware of no rationale for rejecting the claims based upon the description of the process provided in the preamble of the claims. Regardless of whether purifying occurs in the claimed process, the process nonetheless produces a

hexafluoropropylene oxide. Applicants therefore submit that the description of the process in the preamble of the present claims is not in contravention to 35 U.S.C. § 112, second paragraph and respectfully request withdrawal of the rejections.

For the reasons discussed above, Applicants submit that the subject matter of the present claims is not obvious in view of the prior art relied upon by the Office and respectfully request withdrawal of the rejections.

INFORMATION DISCLOSURE STATEMENT

Applicants submitted an IDS and a PTO-1449 listing four references. A partially initialed copy of the 1449 was returned with the Office Action of August 1, 2006. Two of the references listed on the PTO-1449, i.e., reference AO (JP 57-175185) and reference AW (Journal of Synthetic Organic Chemistry), were not acknowledged as considered by the Examiner. Applicants request the Office return a fully signed, dated and initialed copy of the PTO-1449 with the next communication from the Office to acknowledge consideration of all of the references listed thereon.

Respectfully submitted,

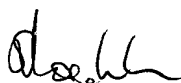
OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon

Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)

NFO:SUK\dt



Stefan U. Koschmieder, Ph.D.
Registration No. 50,238